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(54) APPAREIL ET PROCESSUS DE TRAITEMENT DE L'EAU
(54) WATER TREATMENT PROCESS AND APPARATUS

(57)

An improved method of and system for maintaining an algicidally and bacteriacidally-effective amount of copper and silver canons in water, the method comprising subjecting the water to an electrical cell having at least one electrode comprising an alloy of metallic copper and silver to provide an effective amount of the cations in the water by electrolytic dissolution, the improvement comprising the electrode further comprising zinc. The invention provides a method of treating water without causing the deposition of copper with attendant discolouration on the walls of a swimming pool, spa and the like.

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(12) (19) (CA) **Demande-Application**

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ABSTRACT OF THE DISCLOSURE

An improved method of and system for maintaining an algicidally and bacteriacidally-effective amount of copper and silver cations in water, the method comprising subjecting the water to an electrical cell having at least one electrode comprising an alloy of metallic copper and silver to provide an effective amount of the cations in the water by electrolytic dissolution, the improvement comprising the electrode further comprising zinc. The invention provides a method of treating water without causing the deposition of copper with attendant discolouration on the walls of a swimming pool, spa and the like.

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WATER TREATMENT PROCESS AND APPARATUS

FIELD OF THE INVENTION

This invention relates to the treatment of water, particularly water in swimming pools, spas and the like for the control of bacteria by use of copper and silver ions; apparatus of use in said treatment; and electrodes of use in said apparatus.

BACKGROUND TO THE INVENTION

It is known that copper/silver alloy electrodes placed in an electrolytic flow cell, for example, mounted in the re-circulation system of a swimming pool can provide algicidal and bactericidal concentrations of copper and silver cations. Such a system may, optionally, be used with chlorine or ozone treatments to provide further enhanced sanitized water. Each of the aforesaid electrodes may be operated, alternatively, as a cathode and then anode over a desired set time interval, under the control of a microprocessor.

However, one drawback of the use of such copper/silver alloy electrodes is the unwanted deposition of copper with its attendant discolouration on the PVC lining, fibre glass or concrete sides of the swimming pool, spa and the like.

There is, therefore, a need for an improved copper/silver electrode flow cell which does not produce aforesaid discolouration problems.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved process of water treatment with copper/silver electrode flow cells.

It is a further object to provide improved water treatment apparatus of use with flowable water systems, such as swimming pools, spas, and the like.

It is a further object to provide improved copper/silver electrodes of use in said water treatment process and apparatus.

Accordingly, in one aspect the invention provides an improved method of maintaining an aligicidal and bactericidally-effective amount of copper and silver cations in water, said method comprising subjecting said water to an electrical cell having at least one electrode comprising an alloy of metallic copper and silver to provide an effective amount of said cations in said water by electrolytic dissolution, said improvement comprising said electrode further comprising zinc.

Preferably, the electrode consists essentially of metallic copper, silver and zinc, more preferably, 84 – 95% W/W Cu, 2 – 8% W/W Ag and 2 – 8% W/W Zn. A most preferred composition has about 90% W/W Cu, 5% W/W Ag and 5% W/W Zn.

In a further aspect the invention provides an improved water treatment system for maintaining the concentrations of copper and silver cations at a bactericidally effective level in water, said apparatus comprising a reservoir for said water; water recirculating means for recirculating said water; water filtration means for removing particulate matter from said water; an electrolytic cell in communication with said reservoir for receiving said water; said cell having an electrode comprising a copper-silver alloy for operably providing said water with said copper and silver cations; the improvement comprising said electrode further comprising zinc.

Although the invention includes the use of a single anode according to the invention as hereinabove defined, preferably both the anode and cathode are of an alloy according to the invention; and most preferably with each of the electrodes of the cell being selected periodically to act as an anode and, alternatively, as a cathode, typically, by a daily or weekly change-over of the polarity of the cell.

In a most preferred system and process according to the invention, the rate of dissolution may be selected and varied depending on the volume of water to be treated, re-circulation rate of the water through any filtration system employed for the removal of particulate matter and the metal cation concentrations desired.

The United States Environmental Protection Agency has set maximum levels of 1.3 ppm Cu and 0.5 ppm Ag for swimming pool, spa and like waters. Minimum cation levels of 0.3 ppm Cu and 0.03 ppm Ag are deemed necessary for satisfactory biocidal

control. However, typical concentrations of about 0.5 ppm Cu, 0.003 ppm Ag and 0.03 ppm Zn are preferred in the process of the present invention.

The process is preferably of value wherein the water is maintained at a pH selected from 7.0 – 7.4

In a further aspect, the invention provides a system as hereinabove defined wherein the electrode comprises 84 – 95% W/W copper, 2 – 8%W/W silver, and 2 – 8%W/W zinc.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be better understood, a preferred embodiment will now be described, by way of example only, with reference to the accompanying drawings, wherein:

Fig. 1 represents a schematic drawing of a water treatment system according to the invention;

Fig. 2 is a diagrammatic layout of an electrolytic cell of use in the system according to the invention; and wherein the same numerals denote like parts.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Fig. 1 shows generally as 10 a water treatment system comprising a swimming pool reservoir 12, connected by a side stream conduit 14 to a particulate matter filtration unit 16 and to an electrolytic flow cell 18 connected by side-stream conduit 20. Thus, water circulates through filtration unit 14 and cell 18, under the influence of water circulating pump 22.

With reference to Fig. 2, this shows a cathode 24 and an anode 26, each formed of an 90% W/W Cu, 5% W/W Ag and 5% W/W Zn alloy, and in the form of a cylindrical rod of 3 cm diameter and 10 cm length. Alternative electrode dimensions in other suitable embodiment forms such as, rectangular blocks, plates, discs or the like may be satisfactorily used. The electrodes according to the invention may be made by any

conventional metal melting and admixture techniques to produce a suitable alloy of desired composition.

Electrodes 24, 26 are connected in series, selectively, with each of four resistors 28, 30, 32 and 34, as operatively desired by means of a multiple switch 36 to provide a selected desired current level to the electrodes under, typically, a 12 volt potential. In an alternative embodiment, the aforesaid individual resistors may be substituted with a variable resistor (not shown). The system may, optionally, include a timing mechanism (not shown), whereby the cell is activated for only part of the time, e.g. 3 hours on, followed by 3 hours off, with the further option of reversing the polarity of the electrodes.

Operation of the aforesaid system with a 1×10^5 cubic litre swimming pool over a two year period did not produce copper discolouration of a PVC liner.

Thus, I have found that the aforesaid electrodes, cell, apparatus and method can provide an acceptably non-toxic, efficacious, biocidal concentration of copper and silver ions without unwanted discolouration and fouling of a water reservoir surface.

Although this disclosure has described and illustrated certain preferred embodiments of the invention, it is to be understood that the invention is not restricted to those particular embodiments. Rather the invention includes all embodiments which are functional or mechanical equivalents of the specific embodiments and features that have been described and illustrated.

Claims

1. An improved method of maintaining an algicidally and bacteriacidally-effective amount of copper and silver cations in water, said method comprising subjecting said water to an electrical cell having at least one electrode comprising an alloy of metallic copper and silver to provide an effective amount of said cations in said water by electrolytic dissolution, the improvement comprising said electrode further comprising zinc.

2. A method as defined in claim 1, wherein said electrode consists essentially of metallic copper, silver and zinc.

3. A method as defined in claim 2, wherein said electrode comprises 84 – 95% W/W copper, 2 – 8% silver, and 2 – 8% zinc.

4. A method as defined in claim 3, wherein said electrode consists essentially of 90% W/W copper, 5% W/W silver and 5% W/W zinc.

5. A method as defined in any one of claims 1 – 4 wherein said cell comprises two of said electrodes.

6. A method as defined in claim 5 wherein each of said electrodes is periodically selected to be either an anode or a cathode within said cell.

7. A method as defined in any one of claim 1 – 6 wherein the rate of dissolution of said metals is selectively controlled.

8. An improved water treatment system for maintaining the concentrations of copper and silver cations at an algicidally and a bacteriacidally effective level in water, said system comprising a reservoir for said water; water recirculating means for recirculating said water; water filtration means for removing particulate matter from said water; an electrolytic cell in communication with said reservoir for receiving said water; said cell having an electrode comprising a copper-silver alloy for operably providing said water with said copper and silver cations; the improvement comprising said electrode further comprising zinc.

9. A system as defined in claim 8 wherein said electrode consists essentially of metallic copper, silver and zinc.

10. A system as defined in claim 8 or claim 9 wherein said electrode comprises 84 – 95% W/W copper, 2 – 8%W/W silver, and 2 – 8%W/W zinc.

11. A system as defined in any one of claims 8 – 10 wherein said electrode consists essentially of 90% W/W copper, 5% W/W silver and 5% W/W zinc.

12. A system as defined in any one of claims 8 – 11 wherein said cell comprises two of said electrodes.

13. A system as defined in any one of claims 8 – 12 further comprising dissolution rate means for varying the rate of dissolution of said electrodes.

14. A system as defined in claim 13 wherein said dissolution rate means comprises a variable resistor.

15. A system as defined in claim 13 wherein said dissolution rate means comprises a plurality of fixed resistance resistors.

16. A system as defined in any one of claims 8 – 15 further comprising time control means for controlling the period of time during which each of said electrodes is operable either as an anode or cathode.

17. A copper/silver zinc alloy in the form of an electrode for use in a method as defined in any one of claims 1 – 7 or a system as defined in any one of claims 9 – 16.

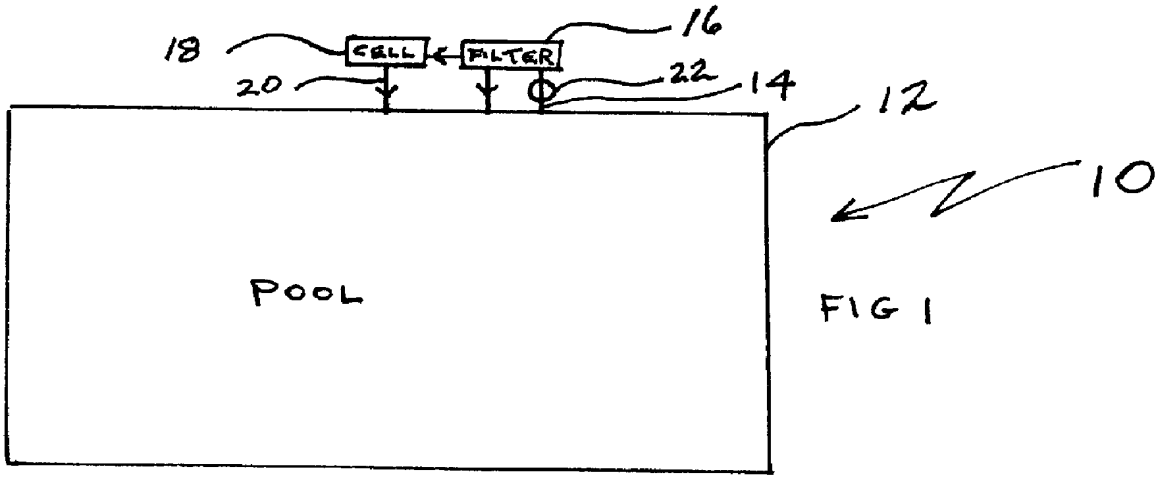
18
CELL
FILTER
16
20
22
14
12
10
POOL

FIG 1

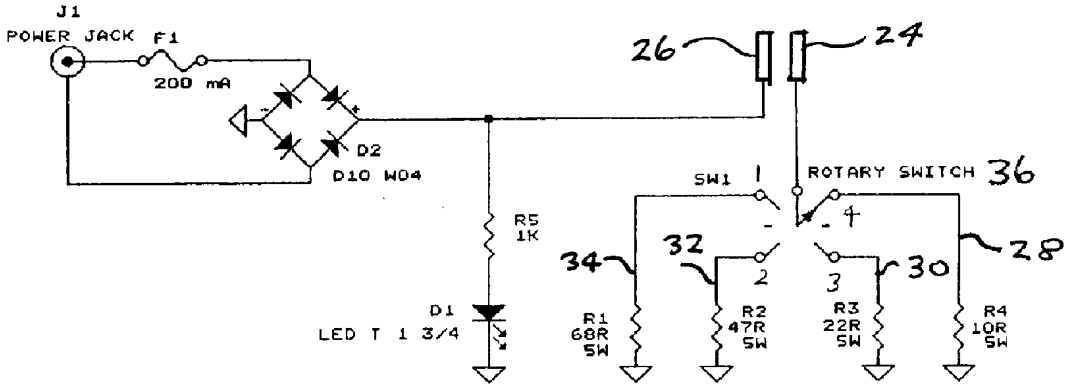
J1
POWER JACK
F1
200 mA
D2
D10 W04
26
24
SW1
1
ROTARY SWITCH
36
4
R5
1K
34
32
2
3
30
28
D1
LED T 1 3/4
R1
68R
5W
R2
47R
5W
R3
22R
5W
R4
10R
5W

FIG 2